

1 **SECTION 9-33 CONSTRUCTION GEOTEXTILE**
2 **February 20, 1996**

3 DIVISION 9 is revised by adding the following new section:

4
5 **9-33 Construction Geotextile**

6
7 **9-33.1 Geotextile and Thread for Sewing**

8 The material shall be a geotextile consisting only of long chain polymeric fibers or
9 yarns formed into a stable network such that the fibers or yarns retain their
10 position relative to each other during handling, placement, and design service life.
11 At least 95 percent by weight of the material shall be polyolefins or polyesters.
12 The material shall be free from defects or tears. The geotextile shall also be free
13 of any treatment or coating which might adversely alter its hydraulic or physical
14 properties after installation. The geotextile shall conform to the properties as
15 indicated in Tables 1 through 6 for each use specified in the Plans. Specifically,
16 the geotextile uses included in this section and their associated tables of
17 properties are as follows:

Geotextile Application	Applicable Property Tables
Underground Drainage, Low Survivability, Classes A, B, and C	Tables 1 and 2
Underground Drainage, Moderate Survivability, Classes A, B, and C	Tables 1 and 2
Separation	Table 3
Soil Stabilization	Table 3
Permanent Erosion Control, Moderate Survivability, Classes A, B, and C	Tables 4 and 5
Permanent Erosion Control, High Survivability, Classes A, B, and C	Tables 4 and 5
Ditch Lining	Table 4
Temporary Silt Fence	Table 6

34 Thread used for sewing shall consist of high strength polypropylene, polyester, or
35 polyamide. Nylon threads will not be allowed. The thread used to sew permanent
36 erosion control geotextiles must also be resistant to ultraviolet radiation. The
37 thread shall be of contrasting color to that of the geotextile itself.

38
39 **9-33.2 Geotextile Properties**

40 **Table 1**
41 Geotextile for underground drainage strength properties for survivability.

Geotextile Property	Test Method ²	Geotextile Property Requirements ¹	
		Low Survivability	Moderate Survivability
Woven/Nonwoven	Woven/Nonwoven		
Grab Tensile Strength, min. in machine and x-machine direction	ASTM D4632	180 lbs/115 lbs min.	250 lbs/160 lbs min.
Grab Failure Strain, in	ASTM D4632	<50%/≥50%	<50%/≥50%

1	machine and x-machine			
2	direction			
3	Seam Breaking Strength	ASTM D4632	160 lbs/100 lbs min.	220 lbs/140 lbs min.
4				
5	Puncture Resistance	ASTM D4833	67 lbs/40 lbs min.	80 lbs/50 lbs min.
6	Tear Strength, min. in	ASTM D4533	67 lbs/40 lbs min.	80 lbs/50 lbs min.
7	machine and x-machine			
8	direction			
9	Ultraviolet (UV)	ASTM D4355	50% strength	50% strength
10	Radiation stability		retained min., after	retained min., after
11			500 hrs. in	500 hrs. in
12			weatherometer	weatherometer

13 **Table 2**
14 Geotextile for underground drainage filtration properties.

Geotextile Property	Test Method ²	Geotextile Property Requirements ¹		
		Class A	Class B	Class C
17 AOS	ASTM D4751	.43 mm max. (#40 sieve)	.25 mm max. (#60 sieve)	.18 mm max. (#80 sieve)
19 Water Permittivity	ASTM D4491	.5 sec ⁻¹ min.	.4 sec ⁻¹ min.	.3 sec ⁻¹ min.

20 **Table 3**
21 Geotextile for separation or soil stabilization.

Geotextile Property	Test Method ²	Geotextile Property Requirements ¹	
		Soil	
		Separation	Stabilization
		Woven/Nonwoven	Woven/Nonwoven
27 AOS	ASTM D4751	.60 mm max. (#30 sieve)	.43 mm max. (#40 sieve)
29 Water Permittivity	ASTM D4491	.02 sec ⁻¹ min.	.10 sec ⁻¹ min.
30 Grab Tensile Strength, min. in machine and	ASTM D4632	250 lbs/160 lbs min.	315 lbs/200 lbs min.
32 x-machine direction			
33 Grab Failure Strain, in	ASTM D4632	<50%/≥50%	<50%/≥50%
34 machine and x-machine			
35 direction			
36 Seam Breaking Strength	ASTM D4632	220 lbs/140 lbs min.	270 lbs/180 lbs min.
38 Puncture Resistance	ASTM D4833	80 lbs/50 lbs min.	112 lbs/79 lbs min.
39 Tear Strength, min. in	ASTM D4533	80 lbs/50 lbs min.	112 lbs/79 lbs min.
40 machine and x-machine			
41 direction			
42 Ultraviolet (UV)	ASTM D4355	50% strength re-	50% strength re-
43 Radiation stability		tained min., after	tained min., after
44		500 hrs. in	500 hrs. in
45		weatherometer	weatherometer

46 **Table 4**
47 Geotextile for permanent erosion control and ditch lining.

Geotextile Property Requirements ¹	
Permanent Erosion Control	Ditch Lining

			Moderate Survivability	High Survivability	
	Geotextile Property	Test Method ²	Woven/Nonwoven	Woven/Nonwoven	Woven/Nonwoven
1	AOS	ASTM D4751	See Table 5	See Table 5	.60 mm max (#30
2	sieve)				
3	Water Permittivity	ASTM D4491	See Table 5	See Table 5	.02 sec ⁻¹ min.
4	Grab Tensile				
5	Strength, min.	ASTM D4632	250 lbs/160 lbs min.	315 lbs/200 lbs min.	250 lbs/160 lbs min.
6	in machine				
7	and x-machine				
8	direction				
9	Grab Failure	ASTM D4632	15%-50%/>50%	15%-50%/>50%	<50%≥50%
10	Strain, in				
11	machine and				
12	x-machine direction				
13	Seam Breaking	ASTM D4632	220 lbs./140 lbs min.	270 lbs/180 lbs min.	220 lbs/140 lbs min.
14	Burst Strength	ASTM D3786	400 psi/190 psi min.	500 psi/320 psi min.	
15	Puncture	ASTM D4833	80 lbs/50 lbs min.	112 lbs/79 lbs min.	80 lbs/50 lbs min.
16	Resistance				
17	Tear Strength,	ASTM D4533	80 lbs/50 lbs min.	112 lbs/79 lbs min.	80 lbs/50 lbs min.
18	min. in machine				
19	and x-machine				
20	Ultraviolet,	ASTM D4355	70% strength	70% strength	70% strength
21	(UV)		retained	retained	retained
22			min, after 500 hrs.	min, after 500 hrs.	min, after 500 hrs.
23			in weatherometer	in weatherometer	in weatherometer

Table 5

Filtration properties for geotextile for permanent erosion control.

Geotextile

Property Requirements¹

Geotextile Property	Test Method ²	Class A	Class B	Class C
AOS	ASTM D4751	.43 mm max. (#40 sieve)	.25 mm max. (#60 sieve)	.22 mm max. (#70 sieve)
Water Permittivity	ASTM D44910	0.7 sec ⁻¹ min.	.4 sec ⁻¹ min.	.2 sec ⁻¹ min.

Table 6

Geotextile for temporary silt fence.

Geotextile Property Requirements¹

Geotextile Property	Test Method ²	Unsupported Between Posts	Supported Between Posts with Wire or Polymeric Mesh
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1	AOS	ASTM D4751	.60 mm max. for slit	.60 mm max. for slit
2			film wovens	film wovens
3			(#30 sieve)	(#30 sieve)
4			.30 mm max for all	.30 mm max. for all
5			other geotextile	other geotextile
6			types (#50 sieve)	types (#50 sieve)
7			.15 mm min.	.15 mm min.
8			(#100 sieve)	(#100 sieve)
9	Water Permittivity	ASTM D4491	.02 sec ⁻¹ min.	.02 sec ⁻¹ min.
10	Grab Tensile ,	ASTM D4632	180 lbs min. in	100 lbs min
11	Strength		machine direction,	
12	min. in machine and		100 lbs min. in	
13	x-machine direction		x-machine direction	
14				
15	Grab Failure Strain,	ASTM D4632	30% max. at 180 lbs	
16	min. in machine		or more	
17	direction only			
18	Ultraviolet (UV)	ASTM D4355	70% Strength Re-	70% Strength Re-
19	Radiation Stability		tained min., after	tained min., after
20			500 hrs. in	500 hrs. in
21			weatherometer	weatherometer

¹All geotextile properties in Tables 1 through 6 are minimum average roll values (i.e., the test result for any sampled roll in a lot shall meet or exceed the values shown in the table).

²The test procedures used are essentially in conformance with the most recently approved ASTM geotextile test procedures, except for geotextile sampling and specimen conditioning, which are in accordance with WSDOT Test Methods 914 and 915, respectively. Copies of these test methods are available at the Olympia Service Center Materials Laboratory in Tumwater.

9-33.3 Aggregate Cushion of Permanent Erosion Control Geotextile

Aggregate cushion for permanent erosion control geotextile, Class A shall meet the requirements of Section 9-03.9(2). Aggregate cushion for permanent erosion control geotextile, Class B or C shall meet the requirements of Section 9-03.9(3) and 9-03.9(2).

9-33.4 Geotextile Approval and Acceptance

9-33.4(1) Source Approval

The contractor shall submit to the Engineer the following information regarding each geotextile proposed for use:

- Manufacturer's name and current address,
- Full product name,
- Geotextile structure, including fiber/yarn type, and
- Proposed geotextile use(s).

If the geotextile source has not been previously evaluated, a sample of each proposed geotextile shall be submitted to the Olympia Service Center Materials Laboratory in Tumwater for evaluation. After the sample and required information for each geotextile type have arrived at the Olympia Service Center Materials Laboratory in Tumwater, a maximum of 14 calendar days will be required for this testing. Source approval will be based on conformance to the applicable values from Tables 1 through 6 in Section 9-33.2. Source approval shall not be the basis of acceptance of specific lots of material unless the lot sampled can be clearly identified and the number of samples tested and approved meet the requirements of WSDOT Test Method 914.

9-33.4(2) Geotextile Samples for Source Approval

Each sample shall have minimum dimensions of 1.5 yards by the full roll width of the geotextile. A minimum of 6 square yards of geotextile shall be submitted to the Engineer for testing. The geotextile machine direction shall be marked clearly on each sample submitted for testing. The machine direction is defined as the direction perpendicular to the axis of the geotextile roll. Source approval for temporary silt fences will be by manufacturer's certificate of compliance as described under "Acceptance Samples."

The geotextile samples shall be cut from the geotextile roll with scissors, sharp knife, or other suitable method which produces a smooth geotextile edge and does not cause geotextile ripping or tearing. The samples shall not be taken from the outer wrap of the geotextile roll nor the inner wrap of the core.

9-33.4(3) Acceptance Samples

Samples will be randomly taken by the Engineer at the job site to confirm that the geotextile meets the property values specified.

Approval will be based on testing of samples from each lot. A "lot" shall be defined for the purposes of this specification as all geotextile rolls within the consignment (i.e., all rolls sent the project site) which were produced by the same manufacturer during a continuous period of production at the same manufacturing plant and have the same product name. After the samples have arrived at the Olympia Service Center Materials Laboratory in Tumwater, a maximum of 14 calendar days will be required for this testing. If the results of the testing show that a geotextile lot, as defined, does not meet the properties required for the specified use as indicated in Tables 1 through 6 in Section 9-33.2, the roll or rolls which were sampled will be rejected. Two additional rolls for each roll tested which failed from the lot previously tested will then be selected at random by the Engineer for sampling and retesting. If the retesting shows that any of the additional rolls tested do not meet the required properties, the entire lot will be rejected. If the test results from all the rolls retested meet the required properties, the entire lot minus the roll(s) which failed will be accepted. All geotextile which has defects, deterioration, or damage, as determined by the Engineer, will also be rejected. All rejected geotextile shall be replaced at no expense to the Contracting Agency.

9-33.4(4) Acceptance by Certificate of Compliance

When the quantities of geotextile proposed for use in each geotextile application are less than or equal to the following amounts, acceptance shall be by Manufacturer's Certificate of Compliance:

Application	Geotextile Quantity
Underground Drainage	600 sq. yards
Soil Stabilization and Separation	1800 sq. yards
Permanent Erosion Control	1200 sq. yards
Temporary Silt Fence	All quantities

1 The Manufacturer's Certificate of Compliance shall include the following
2 information about each geotextile roll to be used:

3
4 Manufacturer's name and current address,
5 Full product name,
6 Geotextile structure, including fiber/yarn type,
7 Geotextile roll number,
8 Proposed geotextile use(s), and
9 Certified test results.

10
11 **9-33.4(5) Approval of Seams**

12 If the geotextile seams are to be sewn in the field, the Contractor shall provide a
13 section of sewn seam which can be sampled by the Engineer before the
14 geotextile is installed.

15
16 The seam sewn for sampling shall be sewn using the same equipment and
17 procedures as will be used to sew the production seams. If production seams will
18 be sewn in both the machine and cross-machine directions, the Contractor must
19 provide sewn seams for sampling which are oriented in both the machine and
20 cross-machine directions. The seams sewn for sampling must be at least 2 yards
21 in length in each geotextile direction. If the seams are sewn in the factory, the
22 Engineer will obtain samples of the factory seam at random from any of the rolls
23 to be used. The seam assembly description shall be submitted by the Contractor
24 to the Engineer and will be included with the seam sample obtained for testing.
25 This description shall include the seam type, stitch type, sewing thread type(s),
26 and stitch density.